
**Fertilizers and soil conditioners —
Mineral soil amendments —
Determination of total calcium and
magnesium content**

*Engrais et amendements — Amendements minéraux —
Détermination de la teneur totale en calcium et en magnésium*

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 134, *Fertilizers, soil conditioners and beneficial substances*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The determination of calcium and magnesium content of mineral soil amendments, and especially total content, is part of the assessment of their properties through their chemical characteristics.

In order to improve efficiency, this document provides a list of existing and relevant methods published all over the world. As most of these methods claim total content, no significant differences are expected between existing methods, provided calibration, sample preparation, dilution and measurement procedures are operated as described. Total extraction is supposed to be the strongest method and to give the highest result.

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Fertilizers and soil conditioners — Mineral soil amendments — Determination of total calcium and magnesium content

1 Scope

This document establishes an overview of the relevant methods for the determination of calcium and magnesium as defined in ISO 8157.

This document is applicable to any mineral soil amendment, neutral, basic or acid containing calcium and/or magnesium.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8157, *Fertilizers and soil conditioners — Vocabulary*

3 Terms and definitions (standards.iteh.ai)

For the purposes of this document, the terms and definitions given in ISO 8157 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 List of existing and relevant methods

The following methods listed in [Table 1](#) have been considered in their scope. All these methods are considered relevant and suitable for the purpose of the determination of total calcium and/or magnesium content in mineral soil amendments defined in ISO 8157.

Table 1 — List of existing and relevant methods for the determination of total calcium and/or magnesium content in mineral soil amendments

Origin	Reference	Title	Official scope	Extraction	Measurement	Ring test r/R
USA	AOAC 917.02 [12]	Calcium in Liming Materials — Gravimetric Method	Liming materials	Information not available	Information not available	Information not available
USA	AOAC 919.01 [13]	Magnesium in liming materials — Gravimetric Method	Liming Materials	Information not available	Information not available	Information not available
USA	AOAC 990.08 [14]	Metals in solid waste, ICP-AES	Waste	—	ICP-AES	Information not available
USA	AOAC 2017.02 [15]	Simultaneous Determination of Arsenic, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, and Zinc in Fertilizers	Fertilizer	Microwave Acid Digestion	ICP-OES ^a	Information not available
USA	EPA 3050 B [5]	Acid digestion of sediments, sludges and soils	Sediments, sludges, soils	Strong digestion (HNO ₃ , H ₂ O ₂ , HCl)	(specially designed for flame AAS or ICP-AES)	—
USA	EPA 3051 [6]	Microwave assisted acid digestion of sediments, sludges, soils and oils	Sludges, sediments, soils and oils	HNO ₃ + microwave digestion, alternative to method EPA 3050	—	yes
USA	EPA 6010 A [7]	Inductively coupled plasma-atomic emission spectroscopy	Trace elements and metals in solution	—	ICP-AES	yes
USA	EPA 6010 B [8]	Inductively coupled plasma-atomic emission spectrometry	Trace elements and metals in solution	—	ICP-AES	yes
USA	EPA 7140 [9]	Calcium (Atomic Absorption, direct aspiration)	See method 7000 (waste)	—	AAS	yes
USA	ASTM D 511 B [10]	Calcium and Magnesium in water by AAS	?	Water	AAS	?
USA	APHA 3120 B [11]	Inductively coupled plasma (ICP) Method	Water and waste water	—	ICP-AES	yes
Canada	BNQ 0419-070/8.4 [12]	Amendements minéraux — Pierre à chaux naturelle — Détermination de la teneur en carbonate de calcium et en carbonate de magnésium	Pierre à chaux naturelle	HCl	— AAS (ASTM D 511 B) — ICP-AES (AOAC 990.08 or EPA 6010 A)	—

^a RESTRICTION: If the dilution is not precise enough, it can bring some bias.

Table 1 (continued)

Origin	Reference	Title	Official scope	Extraction	Measurement	Ring test r/R
Canada	BNQ 0419-090-6/7.6[13]	Amendements calciques ou magnésiens provenant de procédés industriels	Ca(OH) ₂ from acetylene production, dust from burnt lime kilns, CaCO ₃ from kraft paper industry, ashes from wood and ... combustion; steel industry slags, from Portland cement production, egg shells, ...	EPA 3050 B or EPA 3051	— ICP-AES (EPA 6010 B or APHA 3120 B or AOAC 990.08) — AAS (EPA 7140 for Ca, EPA 7450 for Mg)	—
EU	EN 12946:2000[2]	Liming materials — Determination of calcium content and magnesium content — Complexometric method	Liming materials except silicate liming materials	HCl	Titration EDTA — eriochrome black T (Mg) — calcein / thymolphthalein or calcon carbonic acid (Ca and Mg)	yes
EU	EN 12947:2000[3]	Liming materials — Determination of magnesium content — Atomic absorption spectrometric method	All liming materials	HCl	Flame AAS	yes
EU	EN 13475:2002[4]	Liming materials — Determination of calcium content — Oxalate method	Silicate liming materials and other liming materials	HCl and HNO ₃	Titration with potassium permanganate	yes
France	AFNOR NF U 44-148: 1984[16]	Matières fertilisantes — Dosage du calcium — Méthode par spectrométrie d'absorption atomique	Fertilizing products	HCl in NF U44-140	AAS	no
International	ISO 11885:2007	Determination of selected elements by inductively coupled plasma — optical emission spectrometry (ICP-OES), [including Ca and Mg]	Waters, waste waters, sludges, sediments	—	ICP-OES	—

^a RESTRICTION: If the dilution is not precise enough, it can bring some bias.

Bibliography

- [1] ISO 11885, *Water quality — Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES)*
- [2] EN 12946:2000, *Liming materials — Determination of calcium content and magnesium content — Complexometric method*
- [3] EN 12947:2000, *Liming materials — Determination of magnesium content — Atomic absorption spectrometric method*
- [4] EN 13475:2002, *Liming materials — Determination of calcium content — Oxalate method*
- [5] EPA 3050 B, *Acid digestion of sediments, sludges and soils*
- [6] EPA 3051, *Microwave assisted acid digestion of sediments, sludges, soils and oils*
- [7] EPA 6010 A, *Inductively coupled plasma-atomic emission spectroscopy*
- [8] EPA 6010 B, *Inductively coupled plasma-atomic emission spectrometry*
- [9] EPA 7140, *Calcium (Atomic Absorption, direct aspiration)*
- [10] ASTM D 511 B, *Calcium and Magnesium in water by AAS*
- [11] APHA 3120 B, *Inductively coupled plasma (ICP) Method*
- [12] BNQ 0419-070 8.4, *Amendements minéraux, Pierre à chaux naturelle — Détermination de la teneur en carbonate de calcium et en carbonate de magnésium*
- [13] BNQ 0419-090-6 7.6, *Amendements calciques ou magnésiens provenant de procédés industriels*
- [14] AOAC 990.08, *Metals in solid waste, ICP-AES*
- [15] AOAC 2017.02, *Simultaneous Determination of Arsenic, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Selenium, and Zinc in Fertilizers*
- [16] AFNOR NF U44-148: 1984, *Matières fertilisantes — Dosage du calcium — Méthode par spectrométrie d'absorption atomique*
- [17] AOAC 917.02, *Calcium in Liming Materials — Gravimetric Method*
- [18] AOAC 919.01, *Magnesium in liming materials — Gravimetric Method*